

## White Paper

### Multi-Modal Research Effort on Cargo Tank Rollovers

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#### Purpose

The purpose of this paper is to articulate the research efforts completed to date as well as potential future R&D efforts to reduce the number of cargo tank rollovers that occur while motor vehicles are carrying hazardous materials (HM).

#### Background

Rollovers involving HM are among the most serious forms of motor vehicle incidents. From 2005 to 2011 there were more than 150 cargo tank rollovers per year. Studies have demonstrated that in a majority of serious HM incidents involving cargo tank motor vehicles the first harmful event is a rollover of a cargo tank. Rollovers occur in approximately 22 percent of all HM serious crashes involving cargo tanks.<sup>1</sup>

In 2007 the U.S. Department of Transportation (DOT) Federal Motor Carrier Safety Administration (FMCSA) completed a study pertaining to rollover incidents. According to the 2007 study, driver error is the primary reason for the majority of rollovers (74 percent). Decision errors are the most common errors, followed by roughly equal numbers of performance and recognition errors. Inattentiveness and distraction account for about 15 percent. Evasive maneuvers were a factor in 5 to 10 percent of rollovers.<sup>2</sup>

During the first and second quarters of fiscal year 2013, there were total of 13 incidents involving a death or injury. Of these incidents, 23% (3 of 13) involved a rollover and 54% (7 of 13) were contributed to human error. Given the limited information about these types of incidents, the Office of Hazardous Materials Safety (OHMS) initiated a special study for FY 2013 in an effort to collect more accurate information regarding these types of incidents to address. This analysis and potential future research efforts will determine the next course of action to reduce, if not prevent, rollover incidents.

#### Analysis

##### Driver Training

Based on the FMCSA study, approximately 75% of rollovers are contributed to driver error. To address issues surrounding driver's actions FMCSA created the "Cargo Tank Rollover Prevention Video". This video was provided to all cargo tank motor carriers transporting HM. This was an early attempt to complement the existing driver training requirements under 49 CFR 172.700 Subpart H. The proposed research could focus on:

- Analysis and impacts of "Cargo Tank Rollover Prevention Video" within the HM industry
- Evaluation of the current training requirements under 49 CFR 172.700 Subpart H
- Identifying risks associated in inadequate training of hazmat employers/employees

- Studying HM industry's best practices for training drivers involved in transporting HM

#### Anti-Lock Brake System (ABS)

As early as 1995, ABS has been used to improve the stability and steering control on commercial motor vehicles during braking. The statutory authority of these systems resides with the National Highway Transportation Safety Administration (NHTSA). There are various vehicle configurations that are used to transport HM and ABS may perform differently on those configurations. The proposed research effort could focus on:

- Literature review of HM incidents involving commercial motor vehicles equipped with ABS
- Comparative analysis of ABS impacts on various vehicle configurations
- Determination of risks associated in the use of ABS on various vehicle configurations

#### Load Stabilizing Electronic Controls

The 2007 FMCSA study discussed the uses and cost associated with electronic stability aids on commercial motor vehicles. The report concluded that electronic stability aids: 1) can prevent rollovers, 2) can be incorporated on commercial vehicles with ABS, and 3) from a cost-benefit perspective, pay for themselves. The drawback to this type of technology for the HM industry is it provides a false sense of security for the driver and may increase the risks of rollover. The proposed research could focus on:

- Comparative risk analysis of HM incidents of commercial motor vehicles equipped and not equipped with electronic stability aids
- Determination of risks associated with vehicles transportation HM equipped with ABS and electronic stability aids
- Cost-benefit analysis of commercial motor vehicles used to transport HM equipped with ABS and electronic stability aids

#### **Summary**

There are many research studies that discuss ways and methods to prevent rollovers. However, the underlining causes of rollovers are contributed to the commercial motor vehicle driver, human error. There exist various technologies to prevent these rollovers to exist and to some extent have been adopted by the HM industry. As various technologies become inexpensive, such as electronic stability aids, the benefit of incorporating these technologies reduces the risks associated in the transportation of HM. The proposed research to be performed in driver training, ABS and Load Stabilizing Electronic Controls to reduce the occurrence of cargo tank rollovers will allow OHMS to further mitigate the risks associated in transporting HM.

<sup>1</sup> April 2005 Hazardous Materials Serious Crash Analysis: Phase 2 Final Report

<sup>2</sup> April 2007 Cargo Tank Roll Stability Study